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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/015,446	12/12/2001	Norio Kanetsuki	56775(70551)	4596

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02/21/2003

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EXAMINER

VINH, LAN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 02/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/015,446

Applicant(s)

KANETSUKI ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 December 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☒ Certified copies of the priority documents have been received in Application No. 10/015,446.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The Information Disclosure Statement (IDS) filed on 12/12/2001 has been considered. The PTO form 1449 is enclosed in this office action.

### ***Drawings***

2. The drawings of Fig. 1, Fig. 4, Fig. 7, Fig. 8 are objected to because the ratios of Cl<sub>2</sub>:Ar and BCl<sub>3</sub>:Ar appear to be a typographical error since the examiner believes that the applicants intend to refer to the ratio of Cl<sub>2</sub>:Ar and BCl<sub>3</sub>:Ar as disclosed in pages 7-9 of the specification. The examiner suggest replacing "Cl<sub>2</sub>:Al" and "BCl<sub>3</sub>:Al" with --Cl<sub>2</sub>:Ar-- and--BCl<sub>3</sub>:Ar--. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. For the purpose of examination, the claim language of "a change is made in the process gas in a plasma generation period" is best understood as changing the mixture ratio between the two gaseous components of the process gas during an etching period as defined in page 7 and fig. 1 of the specification. The term "output of a plasma exciting power source" is best understood as an increase of output from an upper plasma exciting power source as defined in page 3, page 11 and fig. 6 of the specification.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Yang et al (US 5,827,437)

Yang discloses a multi-step plasma etch method using a process gas (comprises of two gaseous components of  $\text{Cl}_2$  and  $\text{BCl}_3$ ) (col 6, lines 4-5), the process gas is supplied into a plasma process chamber 204 to generate a plasma to plasma etching/process a substrate 206 (col 5, lines 23-48). Yang discloses that the wafer /substrate includes stacked layers of aluminum and Ti barrier layer, the aluminum and Ti layer are plasma etched (col 10, lines 53-59, col 11, lines 8-25 ), which reads on the substrate includes stacked films of at least two types to be etched by the plasma. Yang also discloses that during the main etch step/period to etch the metallization/aluminum layer, the mixture flow ratio between the two gaseous components ( $\text{Cl}_2$  and  $\text{BCl}_3$ ) is changed (col 12, lines 16-25, fig. 3A), which reads on according to any of the stack layers/films is to be etched, a change is made in the process gas in a plasma generation period.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1765

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al (US 5,827,437) in view of Chung (US 5,658,820)

Yang's method has been described above in paragraph 5. Unlike the instant claimed invention as per claim 2, Yang does not disclose changing the bias voltage applied to the substrate together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

However, Chung discloses a method for manufacturing a ferroelectric capacitor by etching a stacked layers structure comprises the step of increasing/changing the DC bias voltage applied to the substrate holder while varying the gas mixture ratio during the etching period (col 4, lines 4-44 ). Chung teaching reads on changing the bias voltage applied to the substrate together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

Hence, one skilled in the art would have found it obvious to modify Yang's method by changing/increasing the DC bias voltage applied to the substrate holder while varying the gas mixture ratio during the etching period as per Chung because according to Chung increasing the bias voltage is one of the optimum condition for increasing the selectivity of one layer with respect to the other layer in the stacked structure (col 4, lines 59-63 )

Art Unit: 1765

8. Claims 3, 4, 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al (US 5,827,437) in view of Chung (US 5,658,820)

Yang's method has been described above in paragraph 5. Unlike the instant claimed inventions as per claims 3-5, Yang does not disclose changing the pressure of the process gas (a plasma generating condition for stably maintaining generation of the plasma) together/simultaneously with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

However, Chung discloses a method for manufacturing a ferroelectric capacitor by etching a stacked layers structure comprises the step of changing the gas pressure while varying the gas mixture ratio during the etching period (col 4, lines 62-64, col 5, lines 17-20; fig. 11 ). Chung's teaching reads on changing the pressure of the process gas (a plasma generating condition for stably maintaining generation of the plasma) together/simultaneously with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

Hence, one skilled in the art would have found it obvious to modify Yang's method by changing the gas pressure while varying the gas mixture ratio during the etching period as per Chung because according to Chung changing the gas pressure is one of the optimum condition for increasing the selectivity of one layer with respect to the other layer in the stacked structure (col 4, lines 59-63; fig. 11 )

9 Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al (US 5,827,437) in view of Abraham (US 6,004,884)

Yang's method has been described above in paragraph 5. Unlike the instant claimed invention as per claim 6, Yang does not disclose changing the output of a plasma exciting power source (a plasma generating condition for stably maintaining generation of the plasma) together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

However, Abraham discloses a method for plasma etching a stacked layers on a semiconductor wafer comprises the step of increasing the output of an upper RF power source while varying the gas mixture ratio during the etching period (col 5, lines 1-3, col 10, lines 33-41, Table 1 ) which reads on changing the output of a plasma exciting power source (a plasma generating condition for stably maintaining generation of the plasma) together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

Hence, one skilled in the art would have found it obvious to modify Yang's method by increasing the output of an upper RF power source while varying the gas mixture ratio during the etching period as per Abraham because as shown in Table 1 of Abraham, the increase of the top RF power source/plasma excited power source also changes the gas mixture ratio of the etch chemistry thus improves the selectivity of one layer with respect to the other during the etching step.

Art Unit: 1765

***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.



LV

February 19, 2003